REMARKS

The foregoing amendment amends the specification to address the informality identified by the Examiner on page 4, line 2. *No new matter is added.* Pending in the Application are claims 1-20, of which claims 1, 8 and 15 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

35 U.S.C. 102 Rejections

In the Office Action, the Examiner rejects claims 1-3, 5-10, 12-17 and 19-20 under 35 U.S.C. 102(e) as being unpatentable over the Czimmek reference (U.S. Patent Number 6,476,599). The Examiner rejects claims 1-4, 6-11, 13-18 and 20 under 35 U.S.C. 102(e) as being unpatentable over the Yanai reference (U.S. Patent Number 6,276,318). The Examiner also rejects claims 1-3, 6-10, 13-17 and 20 under 35 U.S.C. 102(6) as being unpatentable over the Wright reference (U.S. Patent Number 5,991,143). Applicants traverse the rejections, and submit that the presently pending claims, as identified above, are patentable over the cited references. None of the references teaches or suggests applying a brake to an armature in an electromagnetic actuator according to a load condition of the armature, as recited in independent claims 1, 8 and 15.

In the present invention, advantages of applying a brake to an armature based on the load condition of the armature include the preservation of power under high-load conditions, and prevention of collision of the armature with a yoke in low-load conditions. For example, in a high-load condition, when it is more difficult to open the valve, a lower braking force can be used, which allows opening of the valve without using excess electric power. In a low-load condition, when the valve is more easily opened, a stronger braking force is applied to the armature, to prevent the armature from colliding with a yoke of the electromagnet. The cited references do not teach or suggest applying a brake based on a load condition of an armature. Indeed, the cited references do not mention or discuss the effect of a load condition on an armature at all, and therefore fail to teach or suggest applying a brake to an armature *according to* a load condition.

For example, the Czimmek reference is concerned with determining a static position of an armature of an electronically controlled solenoid device without using sensors. To determine the static position of the armature, a flux of a magnetic circuit associated with each coil is ramped in a generally linear manner over a period of time. A nominal position of the armature is defined where current on both of the coils is substantially equal.

According to the Examiner, changing the magnetic flux on the armature in Czimmek results in a brake being applied to the armature. However, the Czimmek reference does not appear to teach or suggest applying a *brake* to the armature, as recited in independent claims 1, 8 and 15. Rather, the Czimmek reference merely describes modifying (i.e., increasing or decreasing) a catch current on an attracting electromagnet based on a terminal voltage of the coil of the attracting electromagnet. The increase or decrease in the catch current is not a *brake* as set forth in the present invention, because the variation in the catch current does not brake or apply any force to the armature to constrain the motion of the armature.

Even if the change in the catch current could be considered to be a brake, the Czimmek reference does not teach or suggest applying a brake to an armature according to a *load condition* of the armature, as recited in independent claims 1, 8 and 15. Rather, the Czimmek reference regulates a rate of change of magnetic flux by measuring a terminal voltage of a coil, which has no relation to the load condition of the armature. The Czimmek reference also does not teach or suggest applying a brake to an armature in response to a *release* of the armature from an end position, as recited in independent claims 1, 8 and 15. Rather, the Czimmek reference merely varies a rate of change of magnetic flux as the armature approaches the *attracting* electromagnet, not based on when the armature is actually released from the opposite end from the attracting electromagnet.

The Wright reference also does not teach or suggest applying a brake to an armature according to a load condition of the armature, as recited in independent claims 1, 8 and 15. The Wright reference is directed to a method of controlling a landing velocity of an armature of an electromagnetic actuator as the actuator moves from a first position to a second position by regulating a rate of change of magnetic flux in a circuit based on a measurement of a terminal voltage of the coil of an electromagnet. The catch current supplied to the attracting

coil is modified depending on the measured terminal voltage. The increase or decrease in the catch current is not a *brake* as set forth in the present invention, since the variation in the catch current does not brake or apply any force to the armature to constrain the motion of the armature. Furthermore, even if the increase or decrease in the catch current could be considered a brake, the modification depends on the terminal voltage of the coil, rather than a *load condition* of the armature. The change in the catch current is also not applied in response to a *release* of the armature from an end position, as recited in claims 1-20.

Regarding the rejection of claims 1-4, 6-11, 13-18 and 20 under 35 U.S.C. 102(e) as being anticipated by Yanai, the Yanai reference also fails to teach or suggest all of the features of claims 1-4, 6-11, 13-18 and 20. The Yanai reference is directed to a solenoid valve actuating apparatus for actuating a plurality of engine valves. The Yanai reference is concerned with making the electromagnetic attracting force exerted between an approaching armature and an electromagnet zero when the armature contacts the electromagnet. By causing the electromagnetic attracting force to vanish promptly at a desired time, an impact force can be reduced to prevent generation of an impact sound and improve the durability of the valve. The Yanai reference is concerned with offsetting or neutralizing an overcurrent through the attracting electromagnet after an exciting current has been cut off by supplying the coil of the electromagnet with a current in the reverse direction. The supplied reverse current causes the electromagnetic attracting force to vanish.

The Yanai reference is *not* concerned with applying a brake to the armature, as recited in independent claims 1, 8 and 15. The reverse current merely *neutralizes* an overcurrent to cause the electromagnetic attracting force to vanish. However, the reverse current does not brake or apply any force to the armature to constrain the motion of the armature. Even if the reverse current could be considered to be a brake, the Yanai reference does not teach or suggest applying a brake according to a load condition of the armature, as recited in claim 1, 8 and 13. In fact, the Yanai reference does not appear to discuss the load condition of the armature at all. Therefore, claims 1-4, 6-11, 13-18 and 20 are patentable over the Yanai reference.

The dependent claims recite additional features neither taught nor suggested in the cited references. For example, neither the Czimmek reference nor the Wright reference teaches or suggests applying a brake by applying a voltage to an electromagnet corresponding to the end position from which the armature is released, as recited in claims 2, 9 and 16. Even if the change in magnetic flux described in both references can be considered a brake, the magnetic flux is applied to the *attracting* electromagnet, rather than the releasing electromagnet.

The Yanai reference also does not teach or suggest applying a brake by applying a voltage to an electromagnet corresponding to an end position from which the armature is released, as recited in claims 2, 9 and 16. In contrast, the Yanai reference applies a reverse current to the *attracting* armature to reduce an electromagnetic attracting force to zero.

The Yanai reference also does not teach or suggest an application of a brake that includes an overexcitation period, a flywheel period and a suspension period in sequence, as set forth in claims 4, 11 and 18.

According to the Examiner, the Yanai reference describes using flywheel current states to provide reversing or braking force for valve actuation. The Examiner is in error. In Yanai, a flywheel current is supplied to an electromagnet of an entirely different, second valve to maintain the second valve in a closed state while a first valve is actuated between open and closed positions. The flywheel current is clearly not applied to the electromagnet corresponding to the end position from which the armature is released, since it is applied to a separate valve entirely. In the flywheel state, the magnitude of a current flowing through a coil is gradually diminished by a circuit resistance. The flywheel current does not provide a reversing or braking force, and merely serves to hold the valve in a closed state.

For at least these reasons, pending claims 1-20 distinguish patentably over the cited references. As such, Applicants respectfully request that the rejection of claims 1-20 under 35 U.S.C. 102 be reconsidered and withdrawn.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

If, however, the Examiner considers that obstacles to allowance of these claims persist, we invite a telephone call to Applicants' representative at the number listed below.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. OAC-018 from which the undersigned is authorized to draw.

Dated: November 18, 2003

Respectfully submitted,

By _____

Anthony A. Laurentano
Registration No.: 38,220
LAHIVE & COCKFIELD, LLP
28 State Street
Boston, Massachusetts 02109
(617) 227-7400
(617) 742-4214 (Fax)
Attorney for Applicants